Alternate Scenarios and Support to Revised Staff Natural Gas Assessment

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R. W. Beck Role in Support of CEC Natural Gas Assessment

- Beck provided alternative supply and demand scenarios to help the Commission evaluate the range of uncertainty
- Also provided some oversight, trouble-shooting and reality-checking of NARG model results
- Participated somewhat in reviewing Scenarios 3B and 5B evaluating impact of lower natural gas demand on gas prices

Uncertainty

- Forecasts end up being wrong because the assumptions turn out to be wrong, often because they depend upon outcomes that cannot be known in advance
- Beck's view is that best approach is a stochastic model
  - Appropriately recognizes that the correct values of the key variables are unknown and lie within a probability distribution of possible values
  - Allows the "answer" to lie within a range instead of producing a point estimate
- CEC has not used NARG that way previously, although conversations with Altos suggest it is possible
- Alternative is to run many, many iterations to create bounds around reference case – a Gas "Scenarios Project"
  - Time consuming and resource intensive
  - Change to reference case means re-running all the iterations

Two Key Uncertainty Variables: Demand and Supply

- The values assumed for natural gas supply and demand are both highly uncertain and debatable
- Key factor affecting demand is how much gas gets burned to generate electricity
  - Scenarios Project demonstrates lower natural gas demand with increasing RPS and EE
  - Driven by emissions regulation, allowance values, and changing capital costs for coal versus gas, IGCC, sequestration, renewables, energy efficiency/demand response and even willingness to consider nuclear option
  - Staff forecast is similar to EIA's until 2011, then diverges by 0.5 to 0.75 Tcf per year
- Beck analysis suggests could be a range of plausible demand around the staff Reference Case of 1.5 to 2.0 Tcf either side

Natural Gas Supply

- Claims that U.S. can't produce enough natural gas oversimplify reality – more sophisticated understanding leads to better policy
- Reserve base grown consistently – reserve additions replace production but many are unconventional reserves
- Chicken and egg on falling production per well: can't produce enough versus drilling wells that produce less due to financial pressure for quick returns
- Drilling overseas not because we don't have enough gas here but because costs lower/profits higher elsewhere -- LNG is conscious choice by producers about where to invest their E&P budgets
- Result is that LNG coming in as price-taker reduces need to produce domestic natural gas and caps prices

Supply Heuristic

- Constructed simple model to calculate supply and illustrate impact of key variables on supply
  - depletion, wells drilled, production per well = domestic production
  - if add demand, can determine how much LNG is needed
  - heuristic makes no comment as to resulting prices
- Change any of these variables and determine impact on production
- Purpose is to capture potential range of plausible supply outcomes and assess implications of Reference Case

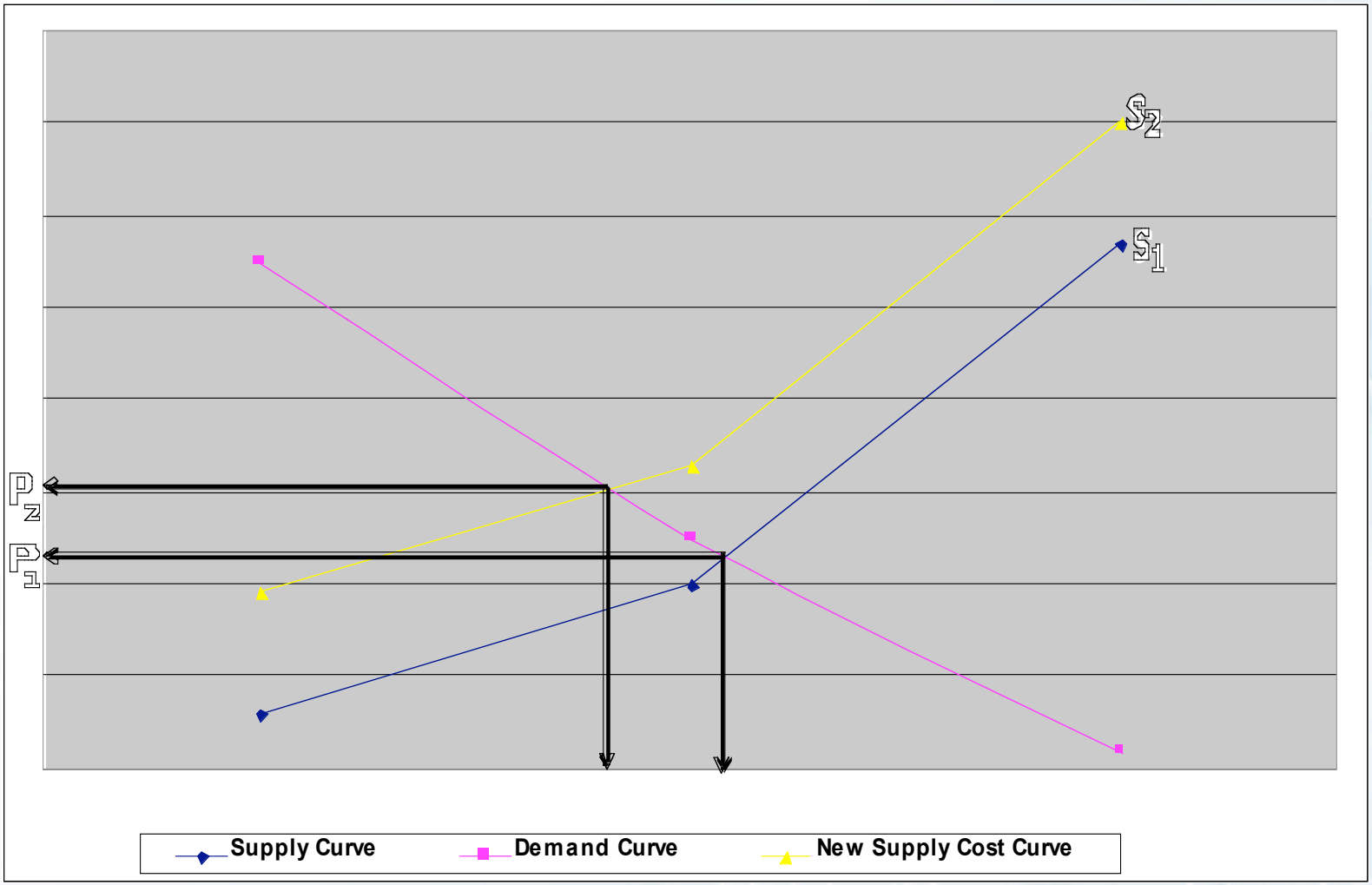
Supply Heuristic Results

	Preliminary Case	Reference Case	High Supply	Low Supply
Aggregate Depletion Loss	-2%	-2%	-2%	-2%
No. of Wells Drilled per Year by 2	45,212	59,728	59,728	30,000
Production per New Well	-4%	-4%	0%	-4%
Canadian Imports	-2.80%	-1.75%	-1.23%	-1.75%
GAP (LNG)	7.1	4.5	0	10.5

Staff Reference Case Broad Results

- Key outcome in the Preliminary Case was seeing very large amount of LNG come to the U.S. -- > 20% of overall supply mix
- Even LNG developers said that was too much
- Yet was economic result: Model's economic dispatch sequenced LNG ahead of domestic production
- Price was set at marginal price on the domestic supply curve (LNG a price taker)
- To develop revised case, staff constrained LNG import capacity to the LNG regasification terminals existing, under construction or approved for expansion
- Less LNG into U.S. means we move up the domestic supply curve to produce more and prices increase accordingly

Opportunity Cost of Less LNG



Impact on Prices